PHILIPS

LOW FREQUENCY FUNCTION GENERATOR

SBC 520

4822 395 30152

4822 736 12117

1. Introduction

The Low Frequenty Function Generator SBC 520 is a compact, portable lightweight instrument featuring simplicity of operation for servicing and training applications. Other features are the two indepent adjustable outputs, a direct reading of the adjusted frequency on a 6 digits LEDdisplay and the additional use of the build-in frequency counter up to 1 MHz. The circuits are build according the newest technoligies and completely protected by a robust housing in modern colours.

2. Technical Data

Frequency range	: 10Hz - 100kHz
Frequency display	: 6 digits 8mm LED's
Output	: 2 seperate adjustable outputs
Output signals	: sine-triangle-square wave forms
-sine wave output	: 2 Vrms max. THD at 315 Hz<1% fig.6
-triangle wave output	: 5 Vp-p max.
-square wave output rise and falltime	: 5 Vp-p max. <0,2 µs
Output impedance	: 50 Ohm
Attenuation	: continuously 20 dB and 0-3-10-20-40-60 dB in calibrated steps
Sinc. output	: square wave 300 mVp-p fixed
Frequency counter	: 10Hz - 1 MHz
Counter input sensitivity	: 100mV rms-1MOhm- 50pF
Power supply	: 110-127-220-240V~ 50/60 Hz
Power consumption	: 12VA max.
Dimensions (mm)	: wxhxd 275x130x205
Weight	: 1 kg.

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SAFETY.

Read this page carefully before installation and use of the instrument.

Instruction

The instrument described in this manual is designed to be used by properly-trained personnel only.
Adjustment, maintenance and repair of the exposed equipment shall be carried out only by qualified personnel who are aware of the hazards involved.

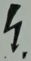
Safety precautions

For the correct and safe use of this instrument it is essential that both operating and servicing personnel follow generally accepted safety procedures in addition to the safety precautions specified in this manual.
Where necessary, warning and caution statements and/or symbols are marked on the apparatus.

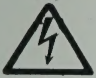
Caution and warning statements

CAUTION is used to indicate correct operating or maintenance procedures in order to prevent damage to or destruction of equipment or other property.
WARNING calls attention to a potential danger that requires correct procedures or practices in order to prevent personal injury.

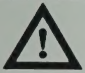
Symbols



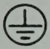
High voltage 1000 V (red)



Live part (black/yellow)



Read the operating instructions (black/yellow)



Protective earth (grounding) terminal (black)

Impaired safety-protection

Whenever it is likely that safety-protection has been impaired, the instrument must be made inoperative and be secured against any unintended operation. The matter should then be referred to the appropriate servicing authority.
Safety protection is likely to be impaired if, for example, the instrument fails to perform the intended measurements or shows visible damage.

3. Instruction for use

3.1 Safety characteristics

This apparatus has been designed and tested in accordance with Safety Class I requirements of IEC Publication 348, Safety Requirements for Electronic Measuring Apparatus, and has been supplied in a safe condition. This manual contains some information and warnings which must be followed by the user to ensure safe operation and to retain the apparatus in a safe condition.

3.2 Installation instructions

Initial inspection.

Check the contents of the shipment for completeness and note whether any damage has occurred during transport. If the contents are incomplete, or there is damage, a claim should be filed with the carrier immediately, and the Philips Sales or Service organisation should be notified in order to facilitate the repair or replacement of the instrument.

3.3 Safety Instructions.

3.3.1. Earthing (Grounding)

Before any other connection is made the instrument shall be connected to a protective earth conductor in one of the following ways:

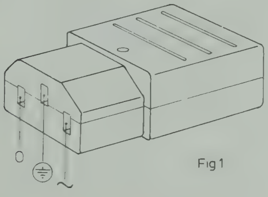


Fig1

via the protective earth terminal;
via the three-core mains cable (fig. 1); The mains plug shall be inserted only into a socket outlet provided with a protective earth contact. The protective action shall not be negated by the use of an extension cord without protective conductor.

WARNING:
Any interruption of the protective conductor inside the instrument, or disconnection of the protective earth terminal, is likely to make the instument dangerous.
Intentional interruption is prohibited.

3.3.2. Mains voltage setting and fuse

- Before inserting the mains plug into the mains socket, make sure that the instrument is set to the local mains voltage.
  Note: If the mains plug has to be adapted to the local situation, such adaption should be done by a qualified person only (see chapter 4.3).
- Make sure that only fuses of the required current rating, and of the specified type, are used for renewal. The use of repaired fuses, and/or the short-circuiting of fuse holders, are prohibited.

- The fuse shall be renewed only by a qualified person who isaware of the hazard involved.

WARNING:
The instrument shall be disconected from all voltage sources when a fuse is to be renewed.

3.4. Controls and sockets (fig. 2)

1. LED display
2. Attenuator channel A (steps)
3. Attenuator channel A (continue)
4. Attenuator channel B (steps)
5. Attenuator channel B (continue)
6. Power on/off switch
7. Frequency range selector
8. Counter in/Frequency out (sync) selector
9. Frequency fine tuning
10. Counter in/Frequency out terminal
11. Wave form selector channel A
12. Output terminal channel A
13. Wave form selector channel B
14. Output terminal channel B

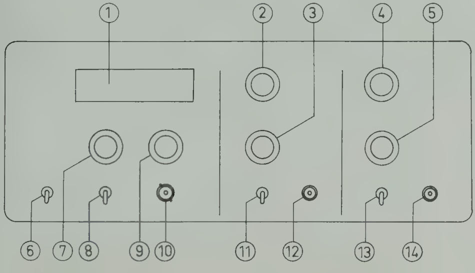


Fig. 2

3.5. Operation instructions (see fig. 2)

3.5.1 General information

This section outlines the procedures and precautions necessary for operation. It identifies and briefly describes the functions of the front panel controls and indicators, and explains the practical aspects of operation to enable an operator to evaluate quickly the instrument's main functions.

Switching "ON"

After the instrument has been connected to the mains (line) voltage in accordance with clauses 3.3.2. it can be switched on. Having switched on the instrument, it is immediately ready for use. The red LED-displays will light on.

3.5.2 Operation.

The front plate is devided in three sections :
left section with the frequency controls, and the middle - and right sections the output channels with their controls.
The frequency is to select with the controls 7 and 9. Control 7 offers a rough selection x1, x10, x100, and x1.000 while control 8 offers the fine-tuning possibility.

The output voltages may be varried by controls 2 and 3 for channel A and controls 4 and 5 vary channel B. With control 2, resp. 4, the output voltage can be varied 60dB in 6 steps. An additional 20 dB variation can be obtained continuously by control 3, resp. 5. So, a total attenuation of 80 dB is possible.
The wave forms : square, triangle or sine on the output are choosen by selector 11, resp. 13.

The signals can be taken of from the output socket 12. resp. 14. The output impedance Zout is 50 Ohms.
Synchronize output (sync out) socket (10) is offering a costant output level of 300 mV square wave form, if the counter in/frequency out selector switch is in position sync out. With this selector switched in position "counter in" the internal counter is connected to socket sync out (10) and is now the input socket for the frequency counter. The input sensitivity of the counter is 100 mV (RMS) and its range is 10 Hz up to 1 MHz.

4. Service data

4.1 diagram description (see fig. 3)

4.1.1 Power supply.

The 12 Volt supply circuitry is build up by a stabilized symmetrically output voltage of + and -12Volt.

To garantee a symmetrical output voltage, one is making use of a voltagedivider made by R22/R23 and an opamp.

4.1.2 Function generator.

The heart of the generator is IC 1. This integrated circuit is producing a triangle wave and a square wave form.

By loading the triangle wave with a variable impedance a sine-wave is obtained.

The outputs of the generator are buffered and than dummy-loaded. This to prevent a change of the amplitude at the output by switching the wave-form selectors.

4.1.3 Amplifier.

The circuit is a broad band amplifier with a balanced outputstage, to obtain the required load condition needed for the attenuator.

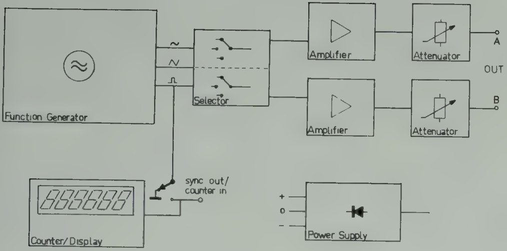


Fig.3

4.1.4 The attenuators.

The step-attenuators are build up by 6 networks for calibrated attenuation possitions. Application of these networks one attains that the output impedance remains always 50 ohms. The maximum attenuation is 60 dB. With the adjustable attenuation of 20 dB R29/R31 a total attenuation of 80 dB is possible.

4.1.5 Frequency Counter/display

The frequency counter contains a universal counter I.C. with a stable on-chip oscillator operating with a 10 MHz crystal. The counter has a 6 digit multiplexed LED-display providing a maximum count of 999999. The gating time will be 1 second, which will give units of hertz in the least-significant digit.

4.2 Access to the parts (fig. 4)

Before removing the covers, the instrument should be disconnected from all voltage sources.

Dismantling

The upper and the lower cover are fixed to the right and left side panels by means of 2 screws on each side (a total of 8 screws "A", Fig. 4)

When replacing the upper or the lower cover, care must be taken not to overtighten these retaining screws.

Make certain that the earth connection is secured when the cover is refitted.

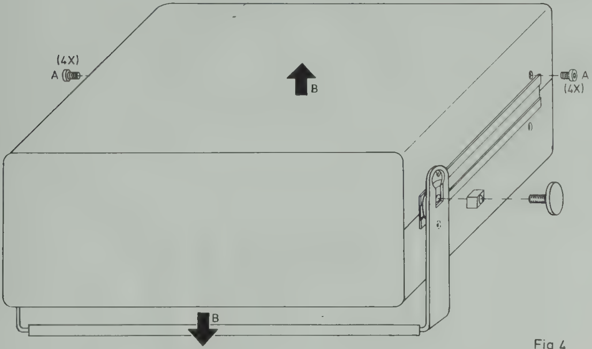


Fig 4

4.3 Adjusting to the mains voltage

Upon delivery the function generater is adjusted to a line voltage of 220/240 V. When the

line voltage is 110/130 V, the function generator must be adapted to this correct line voltage by interchanging the connections on the printed circuit board. In order to meet the safety requirements the wires must be fixed to the solder tags of the P.C.B. in such a way that, when the tin melts, they do not come free. (Fig. 5).
To dismantle the apparatus see 4.2.

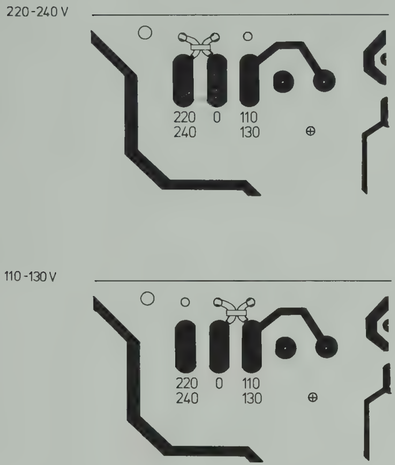


Fig.5

ELECTRICAL PARTSLIST

RESISTORS

Item	Ohm	Tol.%	Type
R 1	560	5	SFR 25
R 2	10k		VAR.RES.LIN.
R 3	56k	5	SFR 25
R 4	5.11k	1	MR 25
R 5	470		ADJ.RES.
R 6	5.11k	1	MR 25
R 7	820k	5	SFR 25
R 8	100k		ADJ.RES.
R 9	10k	5	SFR 25
R10	100k		ADJ.RES.
R11	10k	5	SFR 25
R12	100k		ADJ.RES.
R13	3.3k	5	SFR 25
R14	2.2k	5	SFR 25
R15	10		CR 37
R16	10		CR 37
R17	2.7k	5	SFR 25
R18	100	5	SFR 25
R19	1k	5	SFR 25
R20	1k	5	SFR 25
R21	680	5	SFR 37
R22	5.11k	1	MR 25
R23	5.11k	1	MR 25
R24	390	5	SFR 25
R25	100	5	SFR 25
R26	910	5	SFR 25
R27	100	5	SFR 25
R28			
R29	2.2k		VAR.RES.LIN.
R30	220	5	SFR 25
R31	2.2k		VAR.RES.LIN.
R32	220	5	SFR 25
R33	100k	5	SFR 25
R34	1k	5	SFR 25
R35	270	5	SFR 25

Item	Ohm	Tol.%	Type
R36	270	5	SFR 25
R37	6.8k	5	SFR 25
R38	1k	5	SFR 25
R39	270	5	SFR 25
R40	270	5	SFR 25
R41	6.8k	5	SFR 25
R42	1M	5	SFR 25
R43	120k	5	SFR 25
R44	2.4k	5	SFR 25
R45	10k		ADJ.RES.
R46	120k	5	SFR 25
R47	2.4k	5	SFR 25
R48	10k		ADJ.RES.
R49	100	5	SFR 25
R50	33k	5	SFR 25
R51	33k	5	SFR 25
R52	1k	5	SFR 25
R54	10		CR 37
R55	10		CR 37
R56	10		CR 37
R57	1k		CR 68
R58	10		CR 37
R59	10		CR 37
R60	10		CR 37
R61	10		CR 37
R62	1k		CR 68
R63	10		CR 37
R64	15k	5	SFR 25
R65	49.9	1	MR 25
R66	49.9	1	MR 25
R67	220	5	SFR 25
R68	1k	5	SFR 25
R69	1k	5	SFR 25
R70	19.6	1	MR 25

Item	Ohm	Tol.%	Type
R71	115	1	MR 25
R72	75.0	1	MR 25
R73	60.4	1	MR 25
R74	54.9	1	MR 25
R75	19.6	1	MR 25
R76	115	1	MR 25
R77	75.0	1	MR 25
R78	60.4	1	MR 25
R79	54.9	1	MR 25
R80	90.9	1	MR 25
R81	143	1	MR 25
R82	487	1	MR 25
R83	499	1	MR 25
R84	90.9	1	MR 25
R85	143	1	MR 25
R86	487	1	MR 25
R87	499	1	MR 25
R88	100k	5	SFR 25
R89	22M		VR 25
R90	10k	5	SFR 25
R91	3.3k	5	SFR 25
R92	21K5	1	MR 25
R93	21K5	1	MR 25

SFR 25 = 0,33 W
CR 37 = 0,5 W
CR 68 = 1,15 W
MR 25 = 0,4 W
VR 25 = 0,25 W

CAPACITORS

Item	Farad	Tol.%	Volts	Type
C 1	10µ		16	TANT. ELCO.
C 2	10N			POL. CAP.
C 3	10µ		16	TANT. ELCO.
C 4	390N			PLACO
C 5	39N	1	63	MICRO POCO
C 6	3.9N	1	63	MICRO POCO
C 7	390P	1	63	MICRO POCO
C 8	82P			CER.PLATE
C 9	1000µ		16	ELCO
C10	10N			PLACO
C11	10µ		16	TANT. ELCO.
C12	1000µ		40	ELCO
C13	100N			PLACO.
C14	100N			PLACO.
C15	10µ		16	TANT. ELCO.
C16	10N			PLACO
C17	1N			CER. PLATE
C18	47µ		25	ELCO
C19	47µ		25	ELCO
C21	22N			CER.PLATE
C22	10µ		16	TANT. ELCO.
C23	22N			CER.PLATE
C24	10µ		16	TANT. ELCO.
C25	22N			CER.PLATE
C26	10µ		16	TANT. ELCO.
C27	22N			CER.PLATE
C28	10µ		16	TANT. ELCO.
C29	10N			CER.PLATE
C30	39P			CER.PLATE
C31	65P			TRIMMER
C32	680µ		63	ELCO
C33	1000µ		40	ELCO
C34	100N			PLACO
C35	10µ		16	TANT. ELCO.

SEMI CONDUCTORS

Item	Type	Ordering code
IC 1	ICL8038	4822 209 80344
IC 2	NE531N	5322 209 85571
IC 3	MU78M05	5322 209 85718
IC 4	MU78M12	5322 209 85577
IC 5	LM741	5322 209 85956
IC 6	SN7413N	5322 209 84049
IC 7	ICM7216C	4822 209 81599
TS 1	BC548C	4822 130 44196
TS 2	BC558C	4822 130 44197
TS 3	BD236	4822 130 41026
TS 4	BC548C	4822 130 44196
TS 5	BC548C	4822 130 44196
TS 6	BC548C	4822 130 44196
TS 7	BC548C	4822 130 44196
TS 8	BC558B	4822 130 44197
TS 9	2N2219A	5322 130 40842
TS10	2N2905A	5322 130 40468
TS11	BC558B	4822 130 44197
TS12	2N2219A	5322 130 40842
TS13	2N2905A	5322 130 40468
TS14	BF256B	5322 130 44744
TS15	BSX20	5322 130 40417
D 3	BA317	4822 130 30847
D 4	BA317	4822 130 30847
D 5	BAW62	4822 130 30613
D 6	BAW62	4822 130 30613
D 7	BA317	4822 130 30847
D 8	BA317	4822 130 30847
D 9	BA317	4822 130 30847
D10	BA317	4822 130 30847
D12	1N4002G	5322 130 30684
D13	MAN72A	5322 209 85455
D14	MAN72A	5322 209 85455
D15	MAN72A	5322 209 85455

D16	MAN72A	5322 209 85455
D17	MAN72A	5322 209 85455
D18	MAN72A	5322 209 85455
D19	1N4002G	5322 130 30684
D20	1N4002G	5322 130 30684
D21	1N4002G	5322 130 30684
D22	1N4002G	5322 130 30684
D23	1N4002G	5322 130 30684
D24	1N4002G	5322 130 30684
D25	1N4002G	5322 130 30684
D26	1N4002G	5322 130 30684

MISCELLANEOUS PARTS

F1	Therm. fuse	4822 252 20007
F2	Fuse 100 mAT	4822 253 30006
T 1	mainstransformer	4822 146 30438
S 1	freq.range switch	4822 273 10105
S 2	wave form switch	4822 277 10699
S 3	counter/sync.switch	4822 277 10701
S 4	attenuatorswitch	4822 273 10106
S 5	attenuatorswitch	4822 273 10106
S 6	power on/off	4822 277 10698
S 7	wave form switch	4822 277 10699
Cr 1	cristal 10MHz	4822 242 70676
-	mains inlet	4822 290 60424
-	mains plug FEMALE	5322 266 30057
-	mains plug MALE	4822 264 30169

Curve of distortion output characteristic SBC 520.

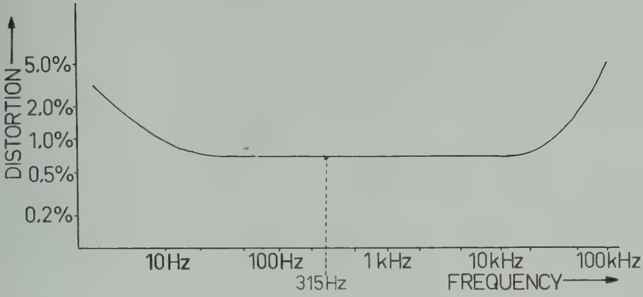


Fig.6

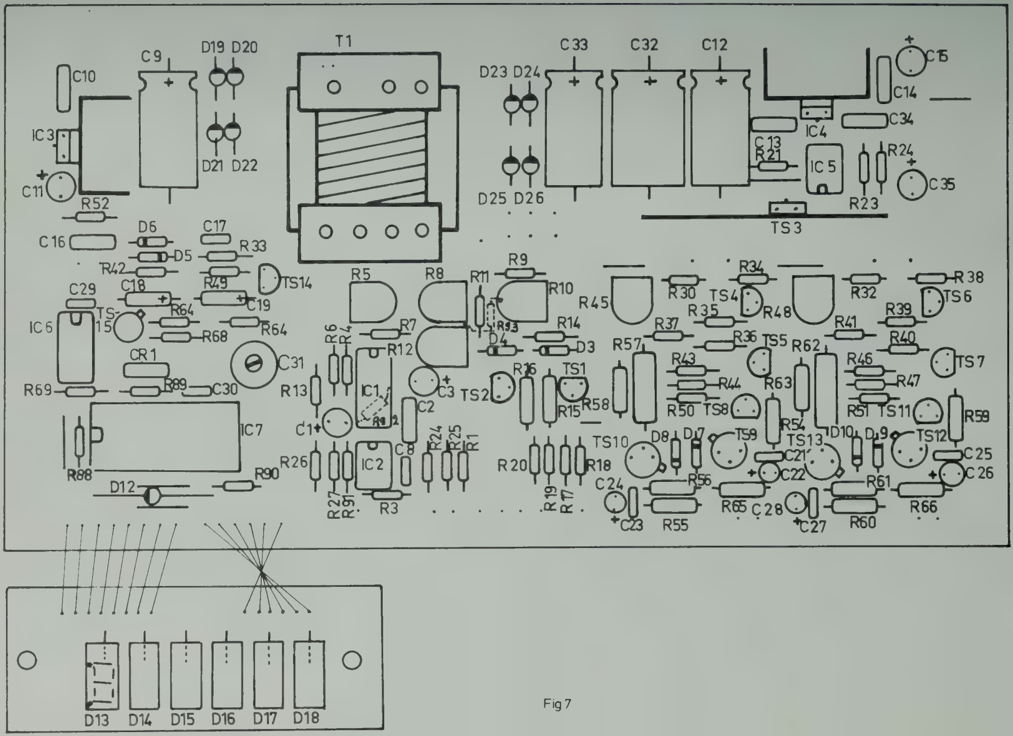
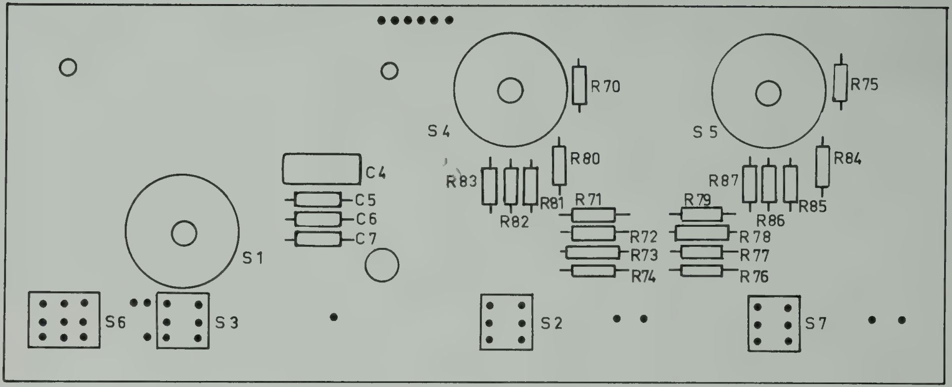

C10
C9
D19 D20
D21 D22
T1
D23 D24
D25 D26
C33
C32
C12
C15
C14
C34
IC4
C13
R21
IC5
R24
R23
C35
TS3
IC3
C11
R52
C16
D6
D5
R42
C17
R33
R49
TS14
C29
C18
C19
R64
IC6
TS15
R68
R64
CR1
C31
R69
R89
C30
IC7
R88
D12
R90
R5
R8
R6
R4
R7
R12
R13
IC1
R11
R93
R10
R9
R14
D4
D3
C3
C2
C1
R26
R27
R91
IC2
R3
C8
R24
R25
R1
TS2
R16
R15
TS1
R58
R20
R19
R17
R18
R45
R30
R34
TS4
R48
R35
R37
R36
R57
R43
R44
R50
TS8
TS5
R32
R38
TS6
R39
R41
R40
R62
R63
R46
R47
R51
TS11
TS7
R59
TS10
D8
D7
TS9
R54
TS13
D10
D9
TS12
C21
C22
C25
C26
C24
C23
R56
R55
R65
C28
C27
R61
R60
R66
D13
D14
D15
D16
D17
D18

Fig 7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R75
S 4
S 5
R80
R84
C4
R83
R87
R81
R71
R79
R85
C5
R82
R86
C6
R72
R 78
C 7
R73
R 77
S 1
R74
R 76
S6
S 3
S 2
S 7

Fig.8

Phillips SBC520

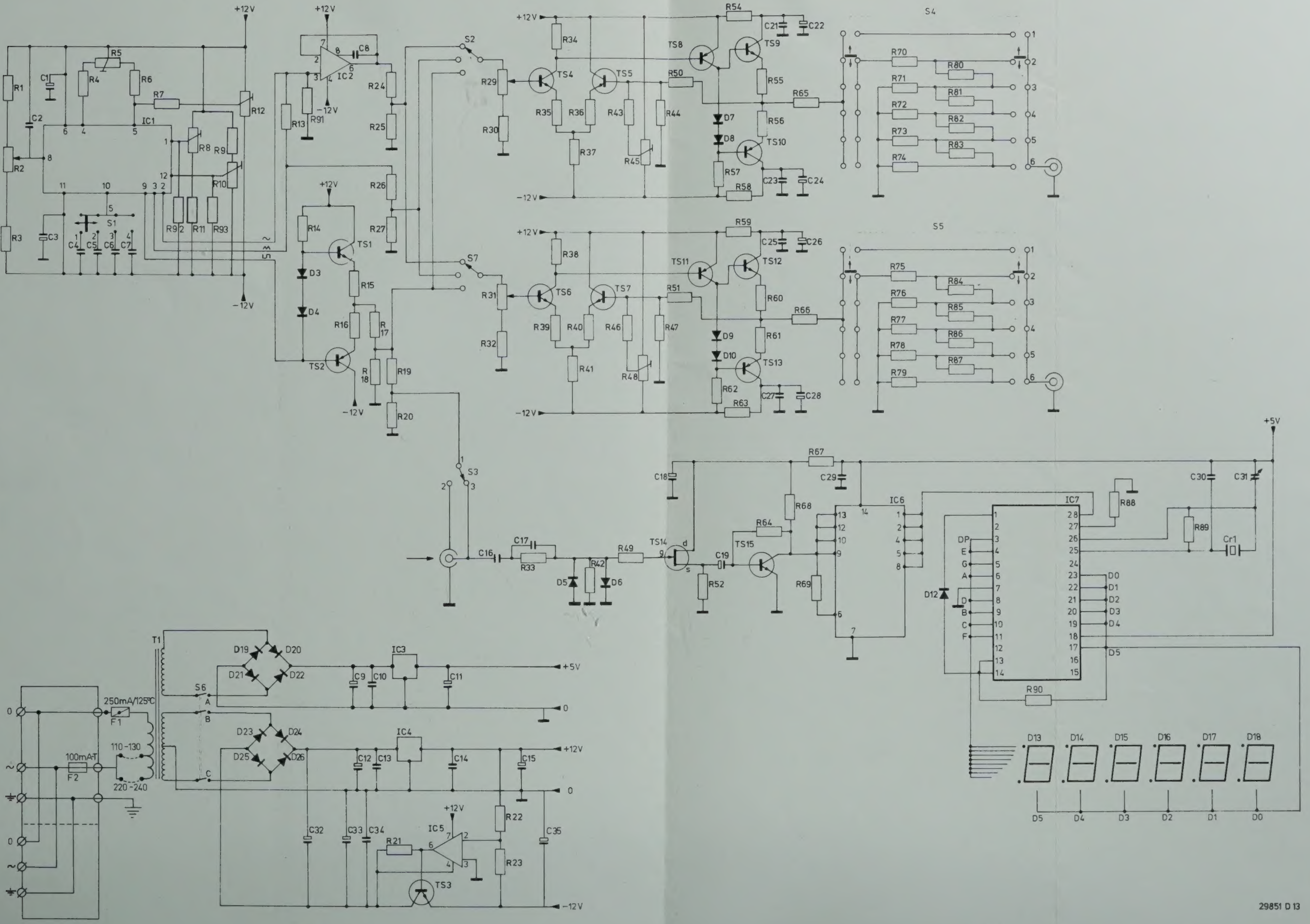

Fig.9